

6640-01-297-4365

TJ6-IM-7  
May 1985

**BECKMAN**

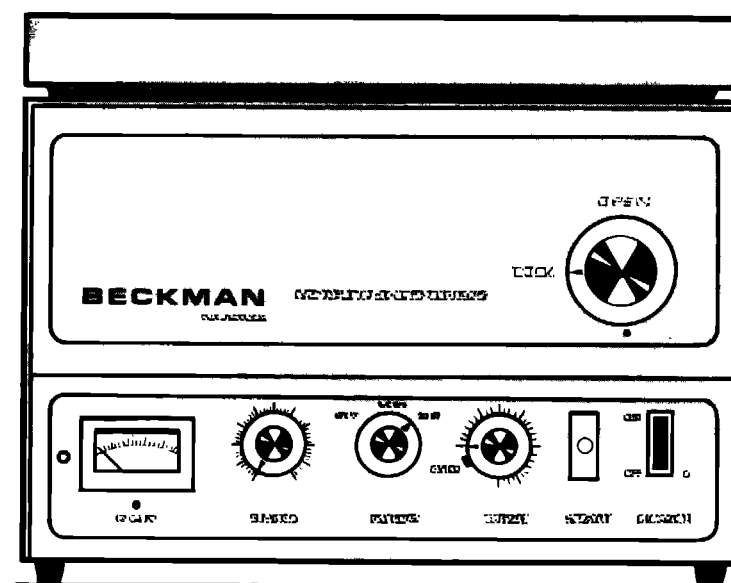
## Instruction Manual



TJ-1-7



# BECKMAN TJ-6 Tabletop Centrifuge



## Instruction Manual



# Contents

---

<b>General Information</b> . . . . .	<b>1</b>
Specifications . . . . .	1
Controls and Indicators . . . . .	7
Name Rating Plate . . . . .	8
<b>Installation</b> . . . . .	<b>9</b>
Unpacking . . . . .	9
Site Selection . . . . .	9
Installation . . . . .	9
<b>Rotors and Accessories</b> . . . . .	<b>13</b>
The TH-4 Swinging-Bucket Rotor . . . . .	13
The TA-10 and TA-24 Fixed-Angle Rotors . . . . .	14
<b>Run Procedure</b> . . . . .	<b>15</b>
Loading . . . . .	15
Speed Derating . . . . .	17
Run Procedure . . . . .	18

<b>Maintenance</b>	<b>21</b>
Cleaning	21
Sterilization	22
Drive Belt Replacement	22
Fuse Replacement	23
Hinge Lubrication	23
Interlock Cable Adjustment	24
Motor Brush Inspection and Replacement	24
RPM Meter Calibration	25
<b>Troubleshooting</b>	<b>27</b>
<b>Parts and Accessories List</b>	<b>29</b>
<b>Warranty</b>	<b>30</b>

# Illustrations

---

Figure 1.	The Model TJ-6 . . . . .	1
Figure 2.	Relative Centrifugal Field vs. Speed for the TA-10 Rotor . . . . .	2
Figure 3.	Relative Centrifugal Field vs. Speed for the TA-24 Rotor . . . . .	3
Figure 4.	Relative Centrifugal Field vs. Speed for the TH-4 Rotor . . . . .	4
Figure 5.	Relative Centrifugal Field vs. Speed for the TH-4 Rotor with 100-mL Tube Holders . . . . .	5
Figure 6.	Relative Centrifugal Field vs. Speed for the TH-4 Rotor with Micro-Test Plate Carriers . . . . .	6
Figure 7.	Typical Name Rating Plate . . . . .	8
Figure 8.	Removing the Chamber Bowl . . . . .	9
Figure 9.	Shipping Material to be Removed before Operating the Centrifuge . . . .	10
Figure 10.	Dimensions and Clearances, TJ-6 . . . . .	11
Figure 11.	An Example of Centered and Balanced Opposing Bucket Loads . . . . .	15
Figure 12.	Examples of How the Horizontal Swing of Buckets is Affected by Proper and Improper Weight Distribution . . . . .	16
Figure 13.	Bottom View of Model TJ-6 . . . . .	22
Figure 14.	Underside of Model TJ-6, Bottom Plate Removed . . . . .	23
Figure 15.	Hinge Lubrication, Rear Oiling Points . . . . .	23
Figure 16.	Hinge Lubrication, Front Oiling Points . . . . .	23
Figure 17.	Interlock Cable . . . . .	24
Figure 18.	Interior of Centrifuge (Bowl Removed) Showing Location of Motor Brushes and Lubrication Points . . . . .	24
Figure 19.	RPM Meter . . . . .	25
Figure 20.	RPM Meter Calibration . . . . .	26





# General Information

## Specifications

### Instrument

Speed Control . . . . .	Continuously variable
Braking System . . . . .	Two-range dynamic plus coast
RPM Indicator . . . . .	Direct-reading meter, 0-7000 rpm
Timer	
Range . . . . .	30 min
Resolution . . . . .	1 min
	HOLD position for continuous runs

### Electrical Rating

North America . . . . .	60 Hz, 120 V, 5A
International . . . . .	50 Hz, 220, 230, or 240 V; 3A

Safety and Convenience . . . . .	Door interlock system, rotor stop indicator, imbalance detector, steel cabinet, stainless steel buckets, color-coded tube racks
----------------------------------	---

### Dimensions

Height, door open . . . . .	35¼ in.(895 mm)
Height, door closed . . . . .	14¾ in.(375 mm)
Access height . . . . .	12½ in.(318 mm)
Overall width . . . . .	19 in.(483 mm)
Overall depth . . . . .	23¾ in.(603 mm)

### Recommended Minimum Clearances

Right side . . . . .	2 in.(50 mm)
Left side and rear . . . . .	4 in.(100 mm)
Weight . . . . .	96 lb (43½ kg)

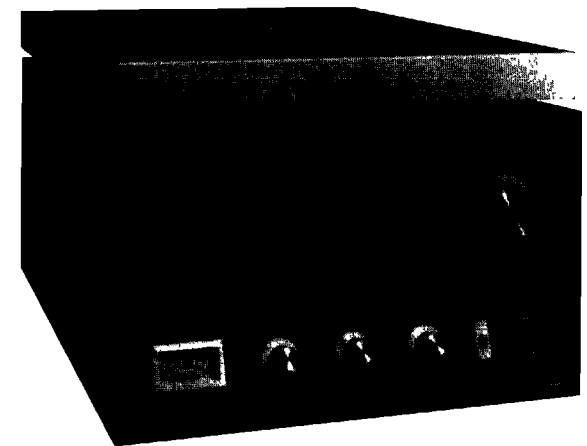


Figure 1. The Model TJ-6

# General Information

## TA-10 Rotor \*

Rated run speed . . . . .	5700 rpm
Relative centrifugal field at $r_{\max}$ (123 mm). . . . .	4470 x $g$
Number of tube cavities . . . . .	10
Tube cavity angle. . . . .	35°
Hole diameter . . . . .	31 mm
Maximum single-cavity load at rated speed (including tube and cap) . . . . .	120 grams
Approximate acceleration time (full load) . . . . .	1 min
Approximate deceleration time (full load and HIGH BRAKE setting). . . . .	1.6 min

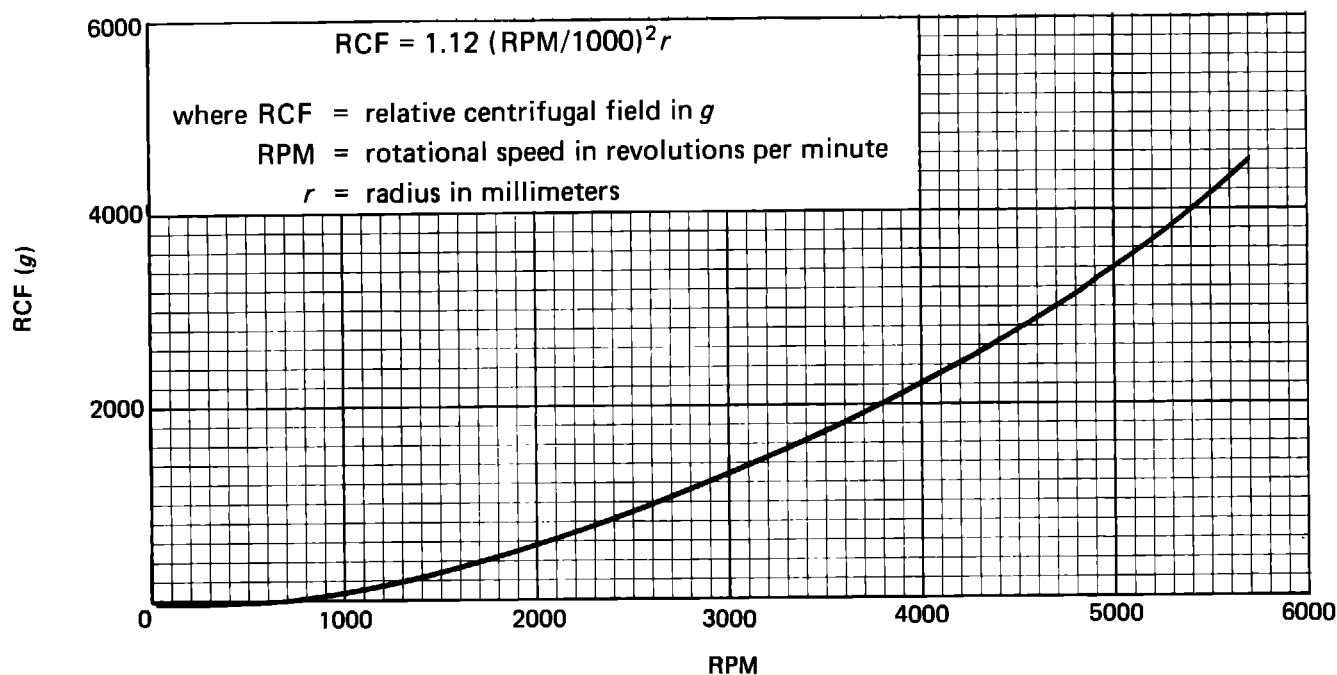


Figure 2. Relative Centrifugal Field versus Speed for the TA-10 Rotor at  $r_{\max} = 123$  mm.

\*U.S. Pat. No. 4,010,890; French Pat. No. 77-00732; Japanese U.M. 1,462,551.

## TA-24 Rotor \*

Rated run speed . . . . .	5700 rpm
Relative centrifugal field at $r_{\max}$	
outer row (123 mm). . . . .	4470 $\times g$
inner row (108 mm). . . . .	3920 $\times g$
Number of tube cavities . . . . .	24
Tube cavity angle . . . . .	35°
Hole diameter . . . . .	19 mm
Maximum tube length for full complement of tubes	
(19 mm diameter) . . . . .	124 mm
Maximum single-cavity load at rated speed . . . . .	36 grams
Approximate acceleration time (full load) . . . . .	1 min
Approximate deceleration time (full load and HIGH BRAKE setting) . . . . .	1.6 min

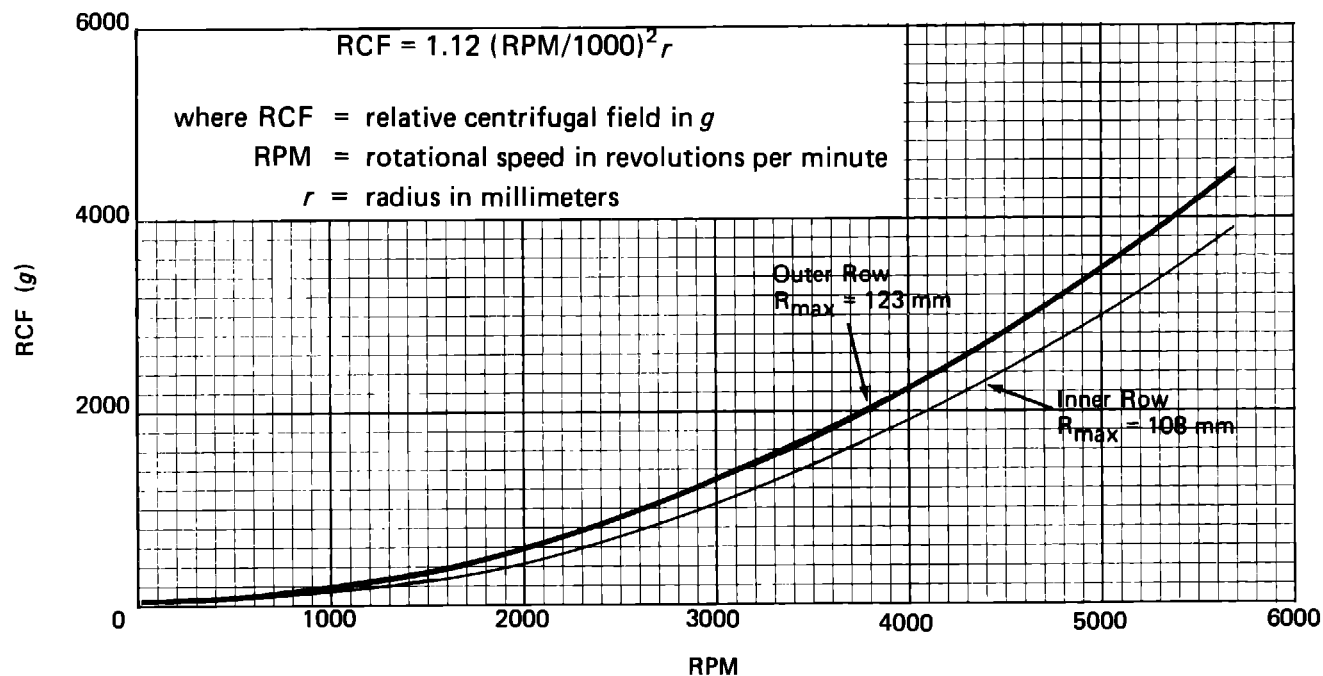


Figure 3. Relative Centrifugal Field versus Speed for the TA-24 Rotor at  $r_{\max} = 108 \text{ mm}$  and  $123 \text{ mm}$ .

\*U.S. Pat. No. 4,010,890; French Pat. No. 77-00732; Japanese U.M. 1,462,551.

# General Information

## TH-4 Rotor with Buckets \*

Rated run speed . . . . .	2700 rpm
Relative centrifugal field at $r_{\max}$ (186 mm). . . . .	1520 x $g$
Number of buckets . . . . .	4
Maximum load per bucket at rated speed (not including weight of buckets) . . . . .	800 grams
Approximate acceleration time (full load) . . . . .	1.5 min
Approximate deceleration time (full load and HIGH BRAKE setting) . . . . .	3.0 min

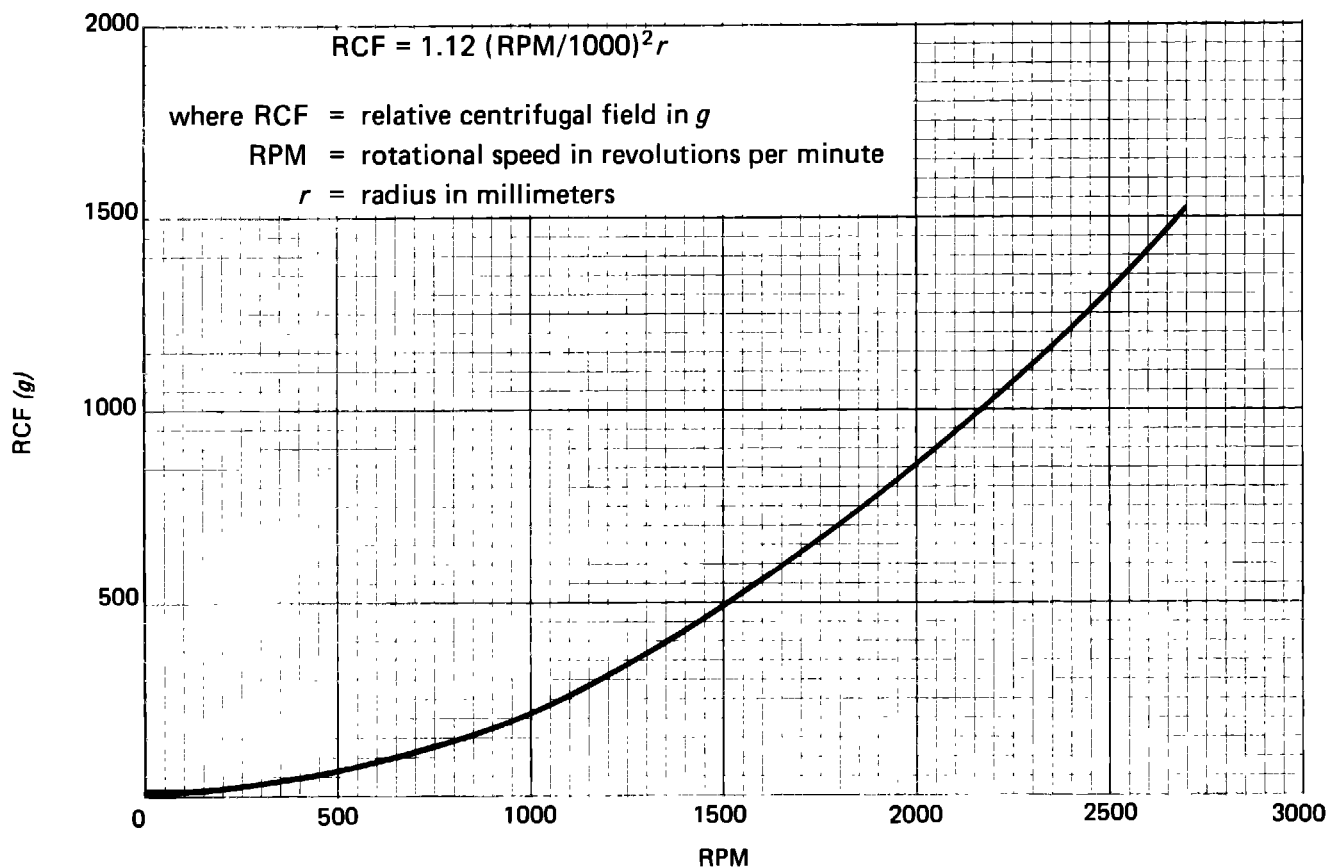


Figure 4. Relative Centrifugal Field versus Speed for the TH-4 Rotor with Buckets at  $r_{\max} = 186$  mm.

\*U.S. Pat. No. 4,148,433.

## TH-4 Rotor with 100-ml Tube Holders

Rated run speed . . . . .	2800 rpm
Relative centrifugal field at $r_{\max}$ . . . . .	1720 x $g$
Number of tube cavities . . . . .	4
Maximum load per cavity at rated speed (including tube, and cap if any) . . . . .	240 grams
Approximate acceleration time (full load) . . . . .	1 min
Approximate deceleration time (full load and HIGH BRAKE setting) . . . . .	2 min

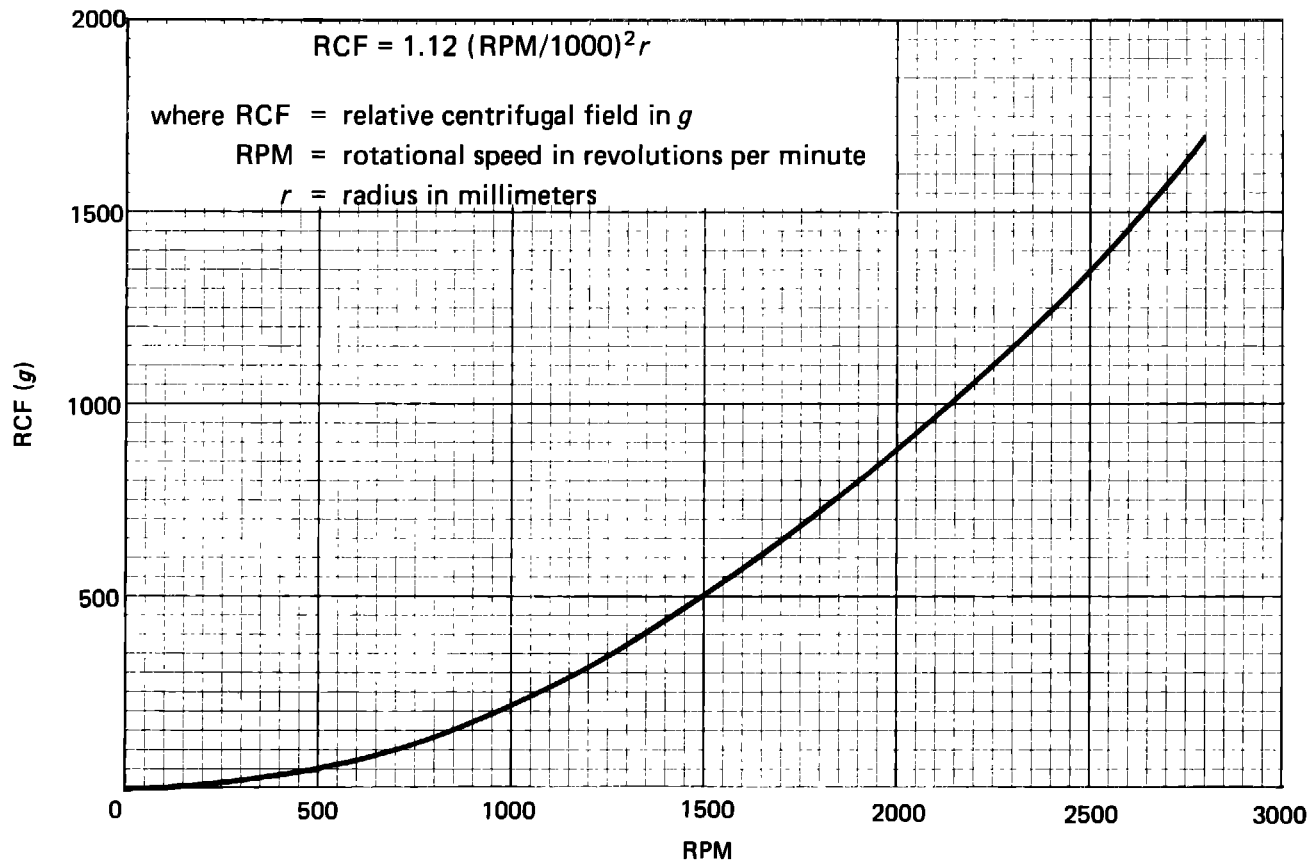


Figure 5. Relative Centrifugal Field versus Speed for the TH-4 Rotor with 100-ml Tube Holders at  $r_{\max} = 201$  mm.

# General Information

## TH-4 Rotor with Micro-Test Plate Carriers

Rated run speed . . . . .	2750 rpm
Relative centrifugal field at $r_{\max}$ (165 mm) . . . . .	1400 x $g$
Number of carriers . . . . .	4
Maximum load per carrier at rated speed . . . . .	
(not including weight of carrier) . . . . .	150 grams
Approximate acceleration time (full load) . . . . .	2.0 min
Approximate deceleration time (full load and HIGH BRAKE setting) . . . . .	2.5 min

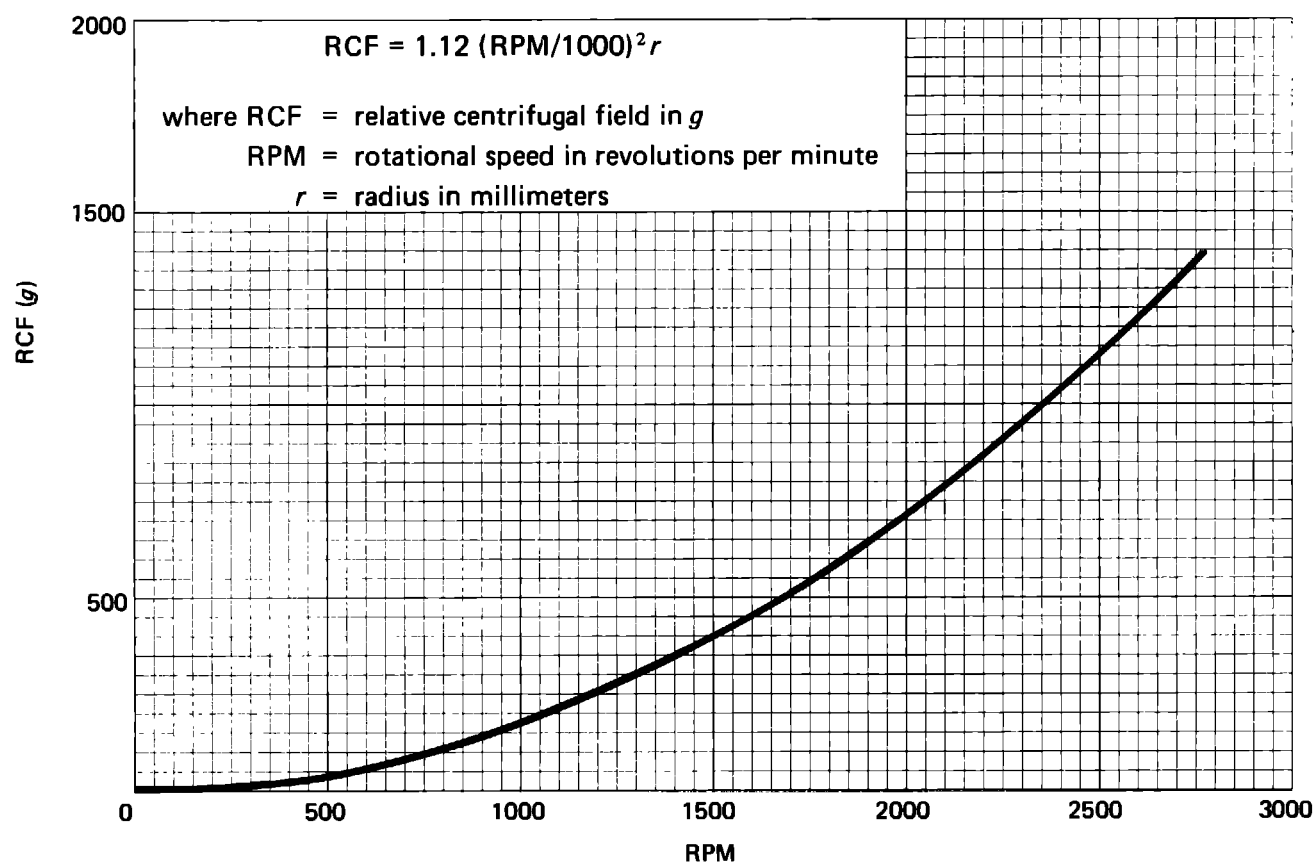


Figure 6. Relative Centrifugal Field versus Speed for the TH-4 Rotor with Micro-Test Plate Carriers at  $r_{\max} = 165$  mm.

## CONTROLS AND INDICATORS

### Door Control

The counterbalanced door is hinged at the back and released from the front panel. When the control knob is turned to the LOCK position and a run is started, the door will stay locked until the run is over. An emergency override for the interlock can be used if the door cannot be opened after the rotor has stopped. Refer to the Emergency Door-Opening Procedure under Operation, below.

### Power Switch

The illuminated rocker switch at the lower right side of the control panel controls all power to the instrument.

### Start Button

The START button, when pressed and released, starts the rotor drive, provided that POWER is ON, the TIME control is not set to zero, and the SPEED control is set to 4 or above.

### Timer

The TIME control can be set for automatically timed runs from 1 to 30 min duration, with 1-min resolution. The HOLD position permits runs of indefinite duration.

### Brake Switch

The three-position BRAKE switch controls the dynamic brake. At the end of a run (timer reads zero), the rotor will decelerate more or less rapidly depending on rotor design, loading, and the position of the BRAKE switch.

### Speed Control

The SPEED control adjusts the power applied to the centrifuge drive motor. The numbers around the dial are arbitrary and are intended for use by the operator in returning to a previously used setting. Actual rotor speed is indicated by the RPM meter. At any given setting, the rotor speed will vary slightly if the line voltage changes.

# General Information

---

## RPM Indicator

The RPM meter indicates true rotor speed.

**NOTE:** Full rotor stop is not necessarily indicated when the RPM meter reaches zero. The rotor stop light to the left of the meter serves that function.

## Rotor Stop Light

When the rotor is not turning and the door-control knob is in the locked position, the red light is on.

## NAME RATING PLATE

When corresponding with Beckman regarding the Model TJ-6 always mention the serial number. The serial number will be found stamped on the name rating plate (Figure 7) affixed to the rear of the instrument.

TABLETOP CENTRIFUGE			
VOLTS	120	HERTZ	60
AMPS	5	INSTALL DATE	
MODEL	TJ-6		
CAT NO	340508	SER	
<b>BECKMAN</b> BECKMAN INSTRUMENTS, INC SPINCO DIVISION 1050 PAGE MILL RD., PALO ALTO, CA 94304			

*Figure 7. Typical Name Rating Plate*



# Installation

## UNPACKING

Check for visible damage and notify the carrier if any is found.

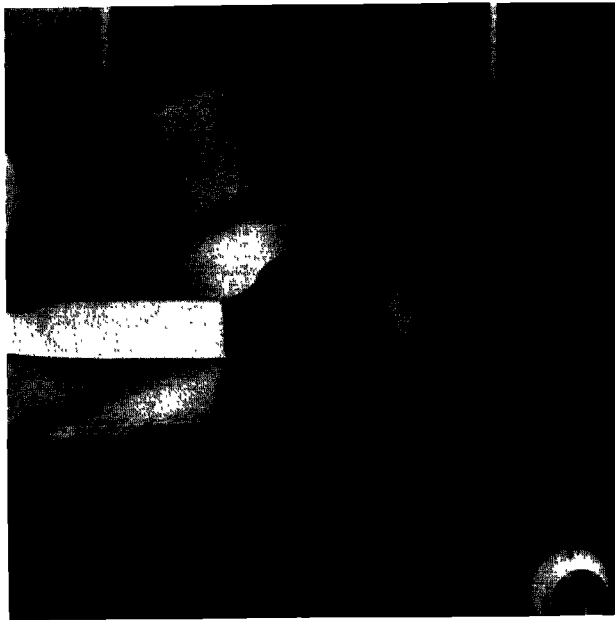
Before connecting the power cable, and with the instrument upright, turn the door control to OPEN. Open the door and remove the chamber bowl and gasket by pulling up on the periphery of the gasket. Do not remove the gasket from the bowl. (See Figure 8.) Remove the red tie-down screw (Figure 9), then pull the motor forward and remove the foam block. *Do not operate the instrument until both the screw and the foam block have been removed.* When reinstalling the bowl, seat it at one point, firmly positioning the gasket within the opening in the housing, then tap it at the diametrically opposite point on the perimeter to force it down. Take care that the gasket does not fold under as the bowl is installed. The gasket should fit evenly around the bowl when it is in place.

## SITE SELECTION

Ambient temperatures during operation should not exceed 40°C. Do not place the instrument near storage or dispensing areas for reagents or combustible fluids. (This is to prevent such materials from entering the instrument's air system and possible ignition by sparking motor brushes.) Maintain the minimum clearances specified in Figure 9.

## INSTALLATION

Plug the power cord from the TJ-6 Centrifuge into a wall outlet.



*Figure 8. Removing the Chamber Bowl*



*Figure 9. Shipping Materials To Be Removed before Operating the Centrifuge. (a) Tie-down screw, (b) Foam block.*

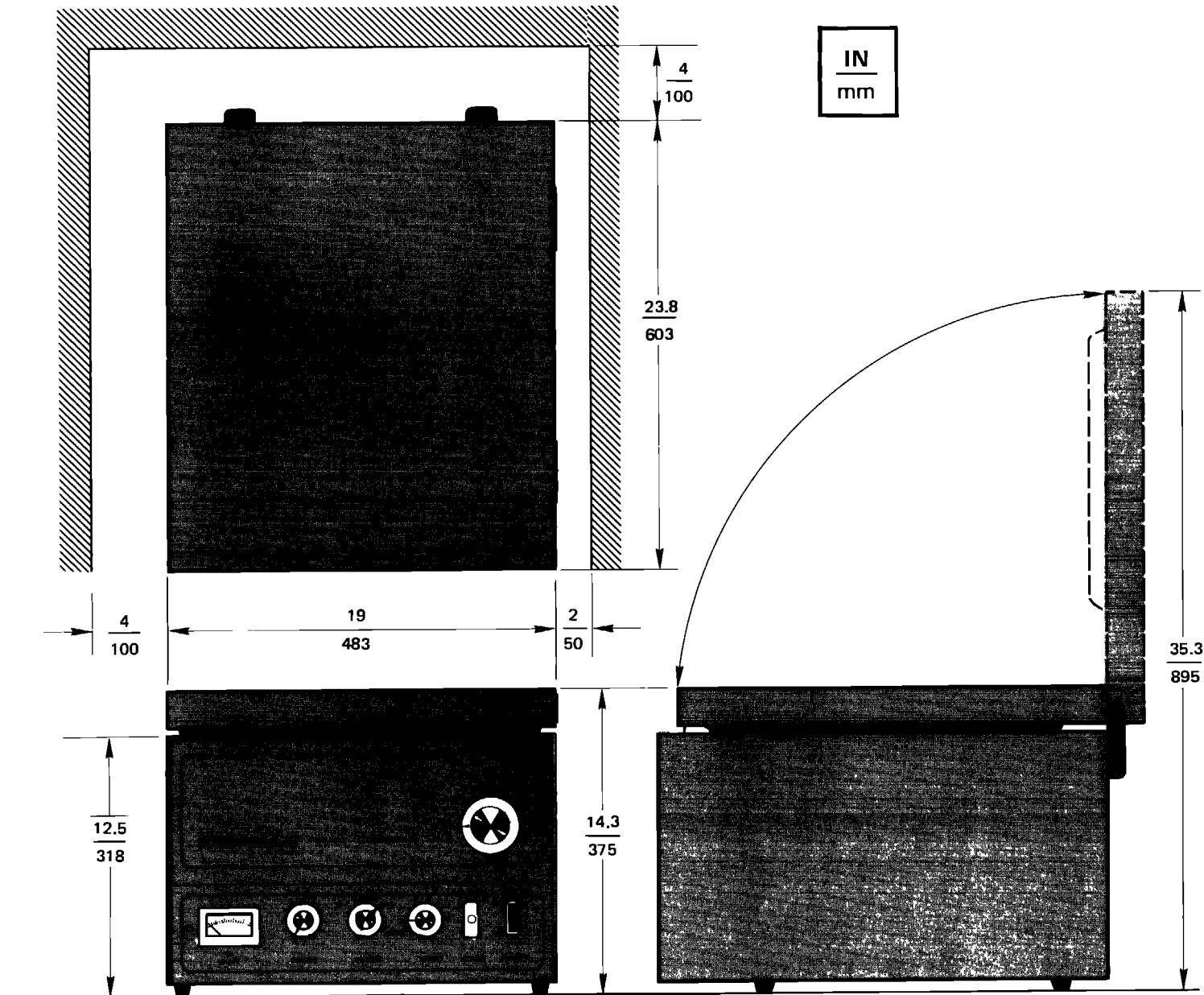


Figure 10. Dimensions and Clearances, TJ-6



# Rotors and Accessories

Rotors that can be used in the TJ-6 Centrifuge include the TH-4, a four-place swinging-bucket rotor capable of carrying a wide range of tube sizes—from 1 to 100 mL; the TA-10, a 10-place fixed-angle rotor for 50-mL tubes; and the TA-24, a 24-place fixed-angle rotor for 15-mL tubes.

## The TH-4 Rotor

The TH-4 rotor can be run with buckets, 100-mL tube holders, or Micro-Test Plate carriers in any balanced combination. The buckets used with the TH-4 rotor are of stainless steel. Test tubes are supported in the buckets by Maxi-Carrier tube racks, which can also be used in the laboratory as test-tube racks. Each color designates a different tube size, but all Maxi-Carriers fit the same buckets. Table 1 gives information on the tube sizes that each Maxi-Carrier can accommodate.

*Table 1. Tubes and Cushions for TH-4 Maxi-Carrier Tube Racks*

Color	Maxi-Carrier		Maximum Tube Diameter (mm)	Maximum Tube Length (mm)	Cushion	
	Part Number	Number of Tubes			Part Number	Quantity
Light green	340130	60	7	125	—	—
Blue	339285	30	12	125	342601	30
Orange	339282	24	14	125	342602	24
Purple	339279	18	16	130	342603	18
Dark green	339276	10	18	134	342604	10
Yellow	339273 <sup>†</sup>	4	29.3	136	342605	4
Red	339288	1	250-mL bottles		—	—

\*The maximum length when running a fully loaded Maxi-Carrier is given. Longer tubes can be run if placed in the center holes of the Maxi-Carrier where there is more clearance between tube and rotor yoke. Always check new tube lengths for clearance by swinging the bucket up by hand before filling tubes. Be sure to include the cap if used.

<sup>†</sup>In addition to four 50-mL tubes, the 339273 rack can also hold four 10 x 75 or 12 x 75 tubes (maximum tube length 130 mm).

# **Rotors and Accessories**

---

The aluminum 100-mL tube holders used with the TH-4 rotor have a single cavity to hold one 100-mL tube (maximum dimensions 45 x 160 mm). A rubber pad supplied with each tube holder fits in the cavity to cushion the tube.

Lubrication is not essential for proper operation of the rotor; however, a thin film of Spinkote™ lubricant applied to the pivot surfaces of the hinge pins (the surface that touches the buckets) will let the buckets swing more freely.

To make balancing easier, buckets are supplied in matched sets. The weight of each bucket is marked on its side. Maxi-Carriers are color coded according to tube size. All Maxi-Carriers that are the same color weight the same and hold the same size tubes.

Carriers for Micro-Test Plates are available for the TH-4 rotor. Each carrier holds one plate for a total of four plates per run. See publication TJ6-TB-008 for instructions regarding the use of Micro-Test Plate carriers in the TH-4 rotor.

## **The TA-10 and TA-24 Fixed Angle Rotors**

The TA-10 rotor has a solid aluminum body with 10 tube cavities for 50-mL tubes (maximum dimensions 31 x 117 mm). The TA-24 rotor has a solid aluminum alloy body with 24 cavities<sup>1</sup> for 15-mL tubes (maximum dimensions 19 x 126 mm). Longer tubes may be used if the diameters are less than the maximum specified, or if the tubes are not placed in adjacent holes (that is, if every other cavity is loaded so that there is an empty cavity between any two tubes).

---

<sup>1</sup> In two rows; outer row: 16 cavities, inner row: 8 cavities.

# Run Procedure

## WARNING

Operator error or tube failure may generate aerosols. Toxic, pathogenic, or radioactive materials must not be run in the TJ-6 centrifuge unless the instrument is operated in an appropriate enclosure and all appropriate safety precautions are taken.

The centrifuge must not be used in the vicinity of flammable liquids or vapors, and such materials must not be run in the centrifuge.

Do not lift or move the centrifuge when the drive motor and rotor are turning.

## CAUTION

Do not bend the driveshaft when installing or removing the rotor.

## LOADING

### The TH-4 Rotor

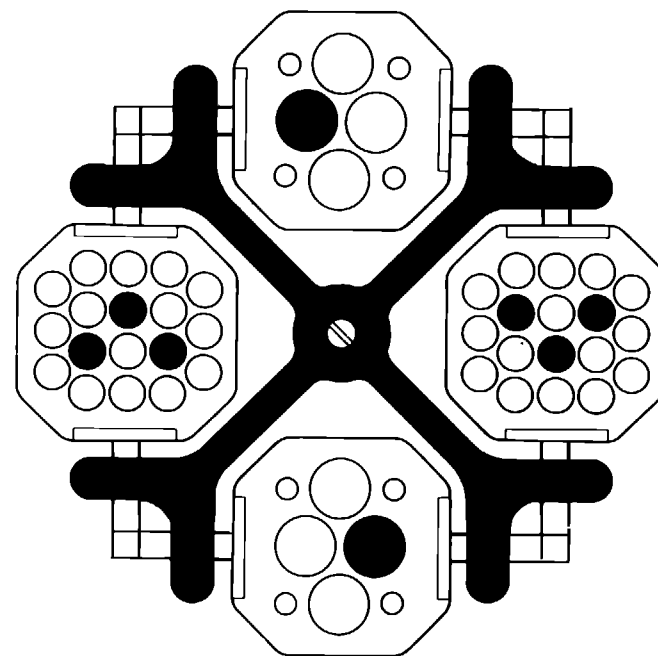
## CAUTION

Always run the TH-4 rotor with buckets, Micro-Test Plate carriers, or 100-mL tube holders in all four positions, even if no loads are placed in them.

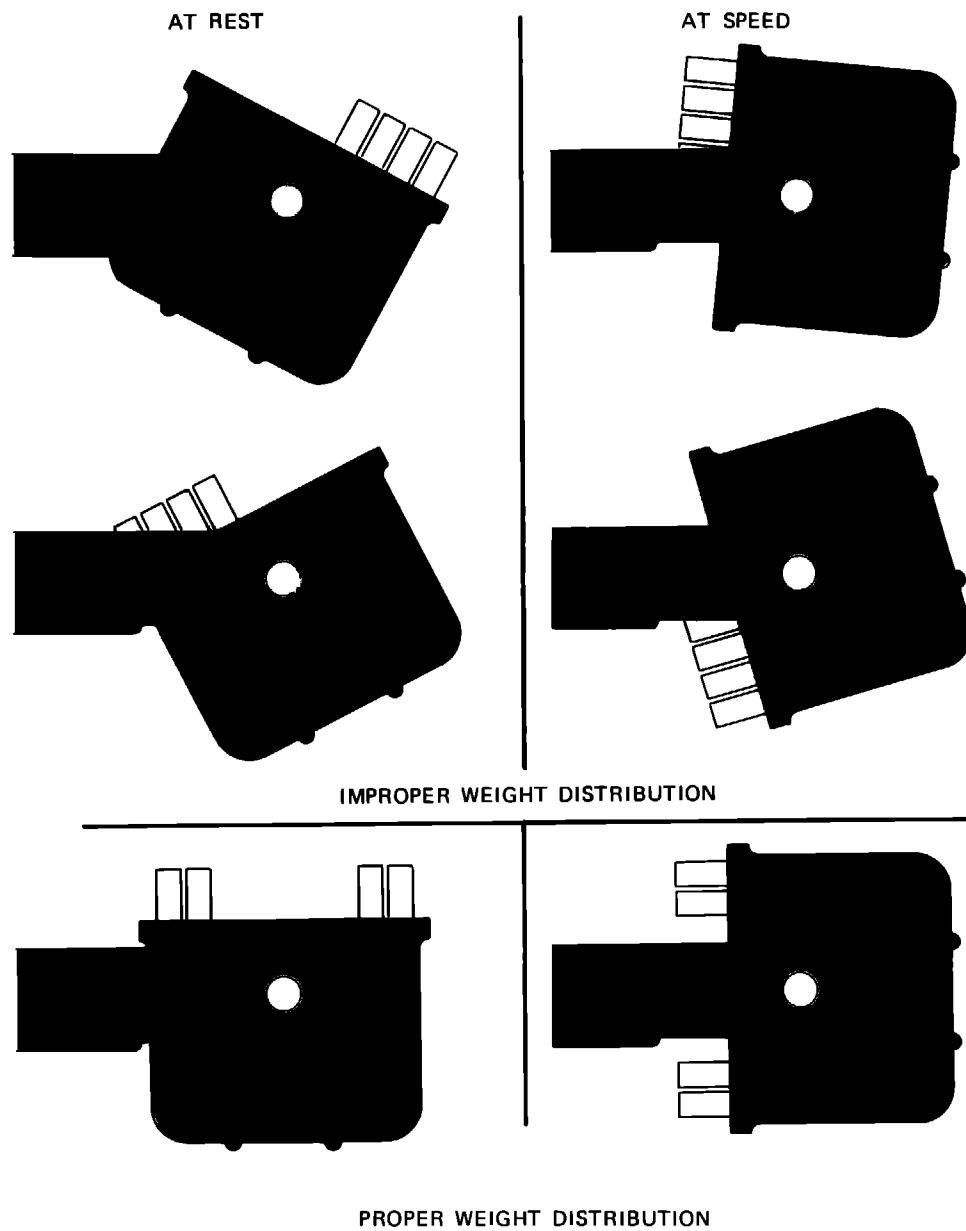
To ensure optimal performance and stability, the TH-4 rotor must be run with balanced loads. This means that opposing buckets and their contents must weigh approximately the same, within 10 grams,<sup>2</sup> and that partially filled Maxi-Carriers must be balanced by proper positioning of tubes. If Maxi-Carriers are to be run partially filled, then each tube must be placed in its Maxi-Carrier so that its weight is balanced by a tube in a diametrically opposed (viewed across the center of the yoke) position in the opposite Maxi-Carrier. See Figure 11 for examples of properly positioned tubes in partially filled Maxi-Carriers.

Improper positioning of tubes in partially filled Maxi-Carriers not only will affect the balance between opposing buckets but also prevent the buckets from achieving optimal horizontal position. See Figure 12. During a run, a bucket will always swing 90° from its rest position. Therefore, if a bucket is not properly loaded so that weight is equally distributed on either side of its pivotal axis, it will not hang vertically at rest and will not swing to a horizontal position during a run. As a result extra stress is placed on the tubes during the run, and the possibility of breakage is increased.

<sup>2</sup> The instrument will shut off if unbalance is excessive.



*Figure 11. An Example of Centered and Balanced Opposing Bucket Loads. Empty buckets can be used, but the rotor must not be run with buckets missing.*



*Figure 12. Examples of How the Horizontal Swing of Buckets is Affected by Proper and Improper Weight Distribution.*



Do not pour samples directly into buckets or tube holders. It is not necessary to fill all the buckets or tube holders, but an empty container must be opposite an empty container. Check tube length by placing a Maxi-Carrier with empty tubes in a bucket and manually swinging the bucket to the horizontal position to be sure that the tubes will clear the yoke. This is important.

## Fixed Angle Rotors

Load the rotor symmetrically so that opposing loads weigh within 10 grams of one another. Install the rotor lid. When the rotor spins, the air pressure differential will hold the lid firmly in place.

## SPEED DERATING

“Maximum” loads specified in the rotor specifications are for operation at the rotor’s rated speed. Heavier loads may be used if the rotor is run at the lower speed determined by the appropriate formula:

### TH-4 with Buckets

$$\text{Speed} = \sqrt{\frac{800}{\text{load (grams)}^*}} \times 2700$$

\*per bucket (not including weight of bucket)

### TH-4 with 100-mL Tube Holders

$$\text{Speed} = \sqrt{\frac{240}{\text{load (grams)}^*}} \times 2800$$

\*per cavity, including tube, and cap if any (not including weight of tube holder)

### TH-4 with Micro-Test Plate Carriers

$$\text{Speed} = \sqrt{\frac{150}{\text{load (grams)}^*}} \times 2750$$

\*per carrier, not including weight of carrier

### TA-10

$$\text{Speed} = \sqrt{\frac{120}{\text{load (grams)}^*}} \times 5700$$

\*Single cavity including tube and cap

### TA-24

$$\text{Speed} = \sqrt{\frac{36}{\text{load (grams)}^*}} \times 5700$$

\*Single cavity including tube and cap

# Run Procedure

---

## RUN PROCEDURE

### WARNING

Do not operate the centrifuge with the chamber bowl out of the instrument.

### CAUTION

Always run rotors with balanced loads.

Turn the door control to **LOCK**.

Turn **ON** the **POWER** switch.

**NOTE:** The **POWER** switch may be left on all day, if desired, but should be turned off for long periods of disuse. It should not be used to stop individual runs except in emergencies, as the rotor stop light is inoperable when the power is off.

Set the run **TIME**.

Select the **BRAKE** rate. **HIGH** is the most practical setting. **LOW** and **OFF** are needed only when a pellet is desired and there is a possibility of remixing.

Press and release the **START** button. The instrument starts when the button is released.

Turn the **SPEED** control to **10**. Slow rotation of the speed control, starting at zero and reaching the extreme clockwise position in 5 to 10 s, is easy on the drive system and will minimize current surges.

When the instrument reaches the desired speed, as indicated by the **RPM** meter, adjust the speed control as required to maintain the desired speed.

- NOTES:**
- a). Acceleration and deceleration times for rotors are given in the specifications.
  - b). If power is interrupted, the drive will turn off and the instrument will go into the braking mode. This will happen if someone turns off the power switch or tries to open the door, or if facility power fails momentarily. The electrical timer will stop, indicating the remaining run time. To restart, press the **START** button.
  - c). Calibration of the **RPM** meter is described under Maintenance, below.
  - d). To end the run for any reason, turn the timer to zero. (Turning the power off will also terminate the run, but this should be done only in emergencies, as the rotor stop light will not operate if the power is off.)

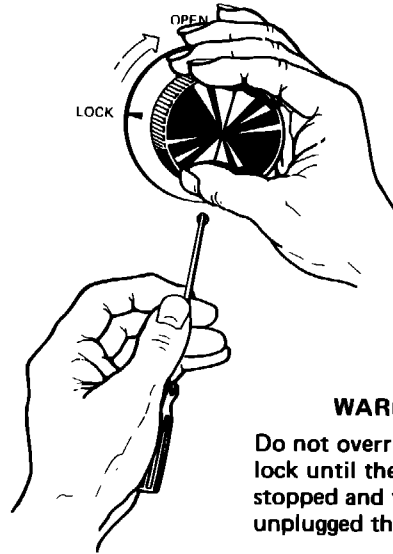
When the timer is turned off or allowed to go to zero, the brake is applied (if set to HIGH or LOW), even if the power switch is off. The period of slight vibration that you may have noticed when the rotor first begins to turn now recurs as it slows. This normal precession occurs at a different speed for each rotor. The door interlock will keep the door locked until the rotor has virtually stopped. Complete stop is indicated when the stop light on the panel comes on.

## EMERGENCY STOP

Turn the POWER switch OFF or pull the plug.

## EMERGENCY DOOR-OPENING PROCEDURE

To override the interlock, insert a small screwdriver or other tool into the small hole below the door control knob. Raise the handle so that the tip of the tool depresses the mechanism as far as possible. While doing this, turn the door control knob to OPEN. (If the screwdriver is inserted too far, it will interfere with the rotation of the knob. If this happens, withdraw the screwdriver and continue turning the knob.)



## WARNING

Do not override the door lock until the rotor has stopped and you have unplugged the instrument.



# Maintenance

Maintenance of the TJ-6 is minimal because of the simple design of its moving parts and the use of such highly dependable components as sealed bearings, which eliminate the need for regular lubrication.

## CLEANING

The instrument's vinyl finish may be wiped with a damp cloth or washed with a mild detergent or spray vinyl cleaner. Do not use acetone or solvents. The interior of the rotor chamber should be kept clean by frequent wiping with a cloth or paper towel.

### WARNING

Always disconnect the power cord before removing the bowl.

The bowl is easily removed for cleaning when spills have occurred. Rinse well and dry thoroughly before replacing.

Cleaning, including wiping up spills, is necessary to prolong the life of the instrument and rotor components. Always clean away spills when they occur, to prevent corrosives or contaminants from drying on component surfaces. When cleaning, use the following methods for the components listed.

### Buckets and Bowl

Wash stainless steel buckets and aluminum bowl using soap, detergent, or cleanser; rinse; dry in air or with a towel.

### Rotors, Yokes, and 100-mL Tube Holders

When spills occur, wash the components in warm water. When caustic materials have been run, wash the rotor and 100-mL tube holders immediately after each run with a lukewarm, dilute solution of a mild detergent of nearly neutral pH, such as Beckman Solution 555™ (diluted 5 or 10 to 1 with water). This preparation is preferred because most laboratory detergents are too strong for anodized finishes. Use a test tube brush (available in the Rotor Cleaning Kit) to clean tube cavities, but do not allow the wire in the brush to scratch the surface. Rinse immediately with distilled water and air-dry upside down. Do NOT use acetone to dry the rotor.

### TUBE BREAKAGE

If a tube should break and all the glass is not contained in the stainless steel bucket, it will be necessary to *thoroughly clean the interior of the chamber bowl*. Disconnect the power cord and remove the bowl. Remove the gasket and rinse the gasket under running water to make sure that no glass particles are retained in it. Make sure that the Maxi-Carriers are clean and that the rubber cushions are in place. Any fine black powder on the underside of the door is the result of sandblasting of the aluminum bowl by glass particles and should be removed.

# Maintenance

## Plastic Maxi-Carriers

Remove the top level of plastic Maxi-Carrier (with care) for cleaning. Do not try to remove the bottom level; it is permanently attached to the sides. Wash with soap or detergent. Scrub with a brush, if necessary, or use a dishwasher. Rinse and dry.

## STERILIZATION

Rotor components can be sterilized by using ethylene oxide or Zephiran Chloride, or by autoclaving up to 125°C.

## DRIVE BELT REPLACEMENT

### WARNING

Any maintenance procedure requiring removal of the bottom panel exposes the operator to the possibility of electrical shock and mechanical injury. For this reason, such service should be done only by trained and qualified personnel. **DISCONNECT THE POWER CORD BEFORE REMOVING THE BOTTOM PANEL.**

### Access

REMOVE THE ROTOR and close and lock the door. Tip the instrument onto its back.

### CAUTION

Do not open the door while the instrument is on its back. The door is spring loaded and will fly open, bending the hinges, which will then have to be replaced.

Remove four feet and two screws (Figure 13) and remove the bottom panel.

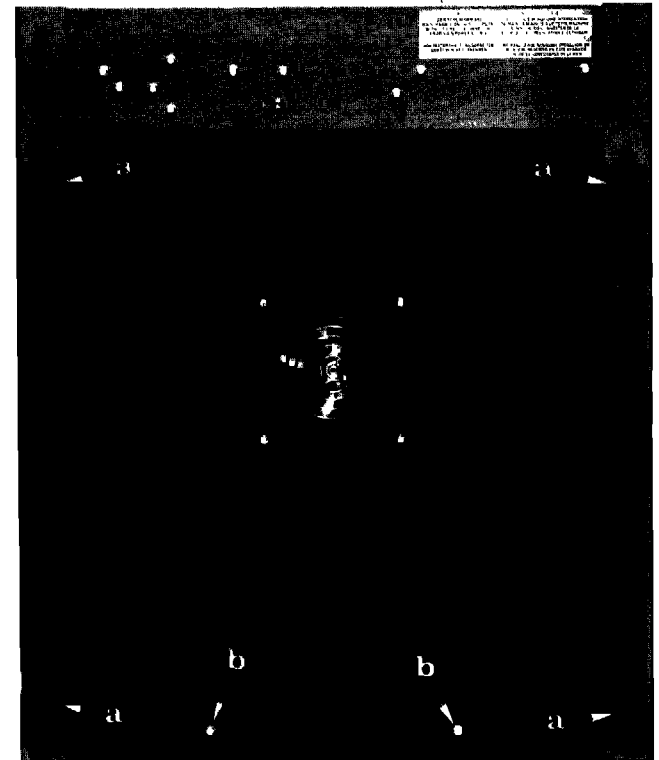
**NOTE:** Star washers are for grounding the bottom panel.

### Belt Removal and Replacement

### CAUTION

The drive belt may be damaged if it is forced over the pulley flange while under tension. Lift the motor as far as possible when removing or replacing the belt.

1. Take hold of the post shown in Figure 14 and lift the motor as far as it will go. Holding the motor in this position, remove the old belt, working it off the motor pulley first.



*Figure 13. Bottom View of the Model TJ-6. Remove four rubber feet (a) and two screws (b) to gain access to lower maintenance points. CAUTION. Do not try to open the door when the instrument is in this position.*

2. Slip the new belt over the fan pulley and, holding the post as before, work the belt over the motor pulley, making sure that it is properly seated before allowing the motor to come back to its natural position.
3. Replace the bottom plate and make a brief test run.

## FUSE REPLACEMENT

Remove the rotor and close and lock the door.

Remove the bottom plate as described under Drive Belt Replacement, above. See Figure 14 for fuse location. For 50-Hz instruments connected to 220, 230, or 240-V source, use 4-A, 250-V time delay fuse. For 60-Hz instruments connected to 120-V source, use 7-A, 125-V time delay fuse.

## HINGE LUBRICATION

When necessary, lubricate the centrifuge door hinges with 30-weight or heavier oil. Just one drop of oil at each of six points on each hinge will ensure smooth operation and long life. Use oil very sparingly. Too much oil will adversely affect the damping action of the hinge. A suggested procedure is to close the lid and apply one drop of oil to each of the two oiling points shown in Figure 15. Then open the lid and apply a drop at each of the four oiling points shown in Figure 16.



Figure 15. Hinge Lubrication, Rear Oiling Points

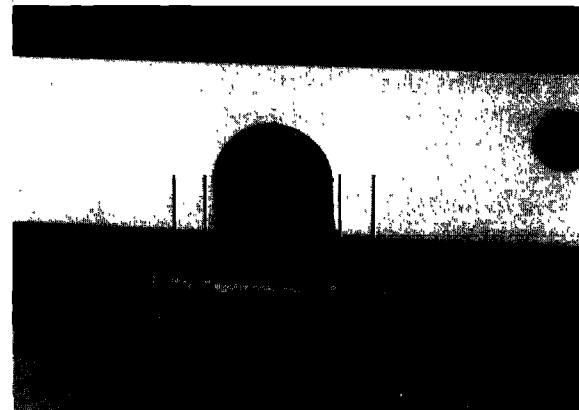


Figure 16. Hinge Lubrication, Front Oiling Points

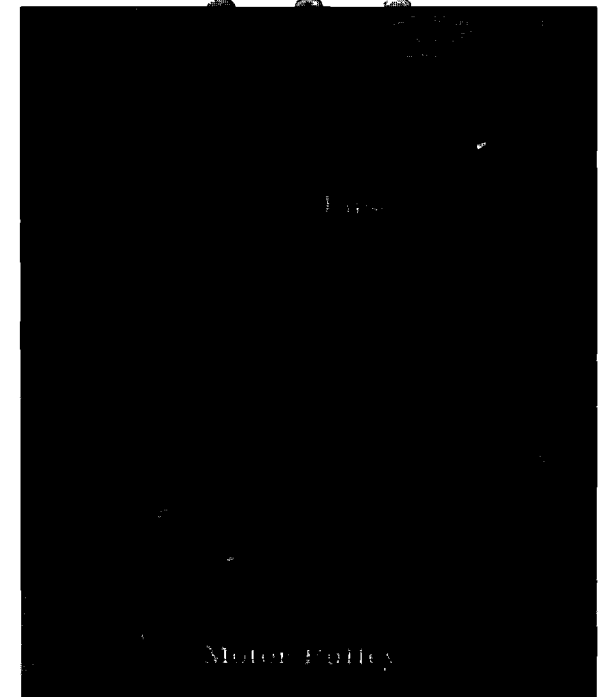


Figure 14. Underside of Model TJ-6, Bottom Plate Removed. Lift post "a" to relieve tension when removing or replacing belt.

## INTERLOCK CABLE ADJUSTMENT

If the centrifuge door-control knob cannot be turned to OPEN after the rotor has stopped, use the Emergency Door-Opening Procedure (under Operation, above). Turn the rotor counterclockwise and try again. If it continues to malfunction, check the gap between the interlock cable and the fan pulley. (The gap should be approximately 1 mm when the knob is in the LOCK position.) Remove the rotor and close and lock the door. Remove the bottom plate as described under Drive Belt Replacement, above, and loosen the nut ("a") shown in Figure 17. Move the assembly to bring the tip of the interlock cable to within about 1 mm ( $\pm 0.25$  mm) of the knurled flange on the drive pulley.

**NOTE:** (U.S. and Canadian customers) A dime is about 1 mm thick.

## MOTOR BRUSH INSPECTION AND REPLACEMENT

### WARNING

Turn off the power.

**NOTE:** This procedure should be done periodically by trained service personnel. Inspect the brushes one at a time and return each to its own cavity in its exact former orientation. Since brush materials vary considerably, only Beckman-approved replacement brushes should be used.

With the centrifuge right side up, remove the bowl. See Figure 18. Remove the brushes one at a time and inspect them. The contact surfaces should be bright. A very black matte surface is indicative of arcing, due to excessive brush wear or hanging up in the brush holder.

On some brushes, a horizontal groove indicates 50% of the original length. When the brush is worn to this point, it should be replaced. Brushes should not be allowed to wear down to less than 3/8 in. (10 mm).

When reinstalling the brush, be sure to orient the cap so that the tabs fit inside the cavity. If the tabs are played, squeeze them together so that they are parallel or slant in a little. If there is any question of whether the brush orientation is the same as before, perform the Wear-in Procedure for New Brushes, as given below.

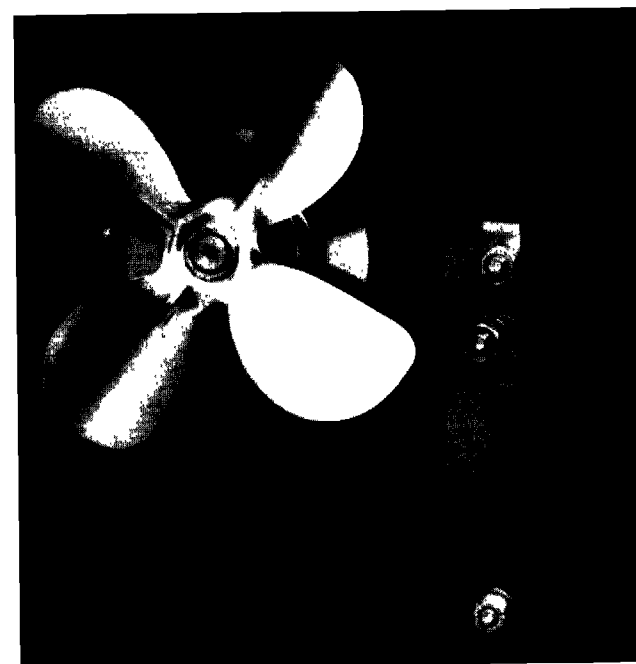


Figure 17. Interlock Cable. Loosen clamping nut "a" to adjust clearance.

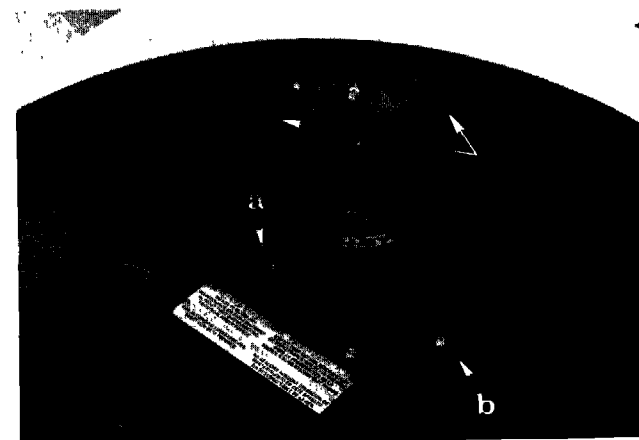


Figure 18. Interior of Centrifuge (Bowl Removed) Showing Location of Motor Brushes and Lubrication Points.



This is a good time to lubricate the motor mounting plate (Figure 18). Use two drops of 30-weight oil at the pivot bolt (a) and the slot (b) so that the plate can move as required to maintain proper tension on the drive belt.

## Wear-in Procedure for New Brushes

New brushes should be permitted to conform to the commutator *before running the centrifuge with a rotor*. Perform the following procedure.

1. Replace the bowl. *Do not install the rotor.*
2. Close the lid
3. Turn the TIME control to HOLD
4. Set the SPEED control to zero
5. Press the START button
6. Start the drive slowly with the SPEED control. Adjust the speed so that the RPM meter indicates between 2000 and 2500 rpm. Do not exceed 2500 rpm.
7. Let the instrument run overnight.

## RPM METER CALIBRATION

**NOTE:** For optimal accuracy, calibrate the RPM meter at the rated speed of the rotor that you will be using.

1. Open the centrifuge door and use a blunt object to compress the sides of the plastic plug in the center of the door so that it can be removed. Remove the plug.

### CAUTION

Do not try to push the plug out without compressing the sides; it may break.

2. Mount the rotor and make a pencil mark on the center of the rotor.
3. Close the door and pull the centrifuge forward a few inches over the edge of the table, just far enough to expose the calibration adjustment hole under the control panel. See Figure 19.
4. With instrument power still off, zero the RPM meter by adjusting the screw under the meter scale on the control panel (Figure 19).

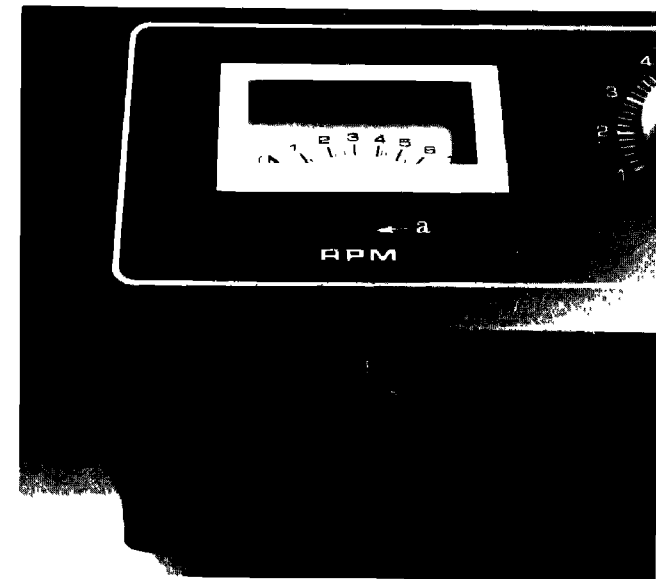


Figure 19. RPM Meter, Showing Zero Adjust (a) and Calibration (b) Hole

# Maintenance

5. Set the door-control knob to LOCK and the SPEED control to 10.
6. Set the TIME control to 10 and the BRAKE control to HIGH, turn the POWER switch ON, and press the START button.
7. When the rotor reaches the desired speed, take a stroboscopic reading through the hole in the centrifuge door.<sup>3</sup> See Figure 20.
8. Turn the adjustment screw under the control panel (Figure 19) to set the RPM meter so that it agrees with the stroboscopic reading.
9. Turn the instrument off and allow the rotor to come to a complete stop.
10. Reposition the instrument in its former position.
11. Reinstall the plastic plug in the door.

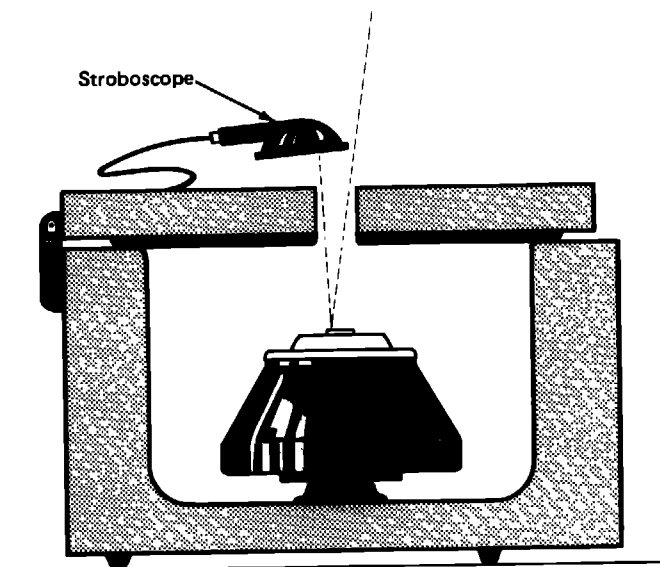


Figure 20. RPM Meter Calibration

<sup>3</sup> E.g., *Strobotac 1531AB*, available from General Radio, West Concord, Massachusetts 01781.

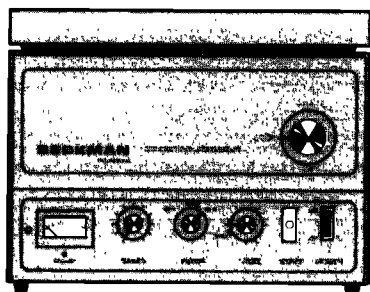
# Troubleshooting

Problem	Cause	Solution
Motor shuts off before rotor reaches set speed	Rotor is not balanced.	<ol style="list-style-type: none"> <li>1. Balance tubes within 10 g</li> <li>2. Load rotor symmetrically</li> <li>3. Check buckets for unusual additional loads such as broken tubes, spilled liquid, and accumulated condensed water</li> </ol>
Rotor cannot achieve top speed	<ol style="list-style-type: none"> <li>1. Line voltage is below rating</li> <li>2. Brushes worn</li> <li>3. New brushes</li> <li>4. Worn motor commutator</li> </ol>	<ol style="list-style-type: none"> <li>1. Check by plugging instrument into a circuit that is not overloaded.</li> <li>2. Replace brushes*</li> <li>3. Allow brushes to seat by running the instrument overnight (without a rotor) at 2000-2500 rpm</li> <li>4. Motor must be replaced*</li> </ol>
Erratic or no braking	Brushes worn	Replace brushes*
Rotor cannot be removed from the shaft	Rotor seized on the shaft	<p><b>CAUTION</b> To avoid bending and permanently damaging the shaft, do not apply any lateral force to the rotor.</p> <ol style="list-style-type: none"> <li>1. Take out plastic plug in center of rotor</li> <li>2. Insert a ¼-20 screw in the hole</li> <li>3. Hold the rotor steady to keep it from turning and turn the screw to force the rotor off the shaft</li> <li>4. Clean the shaft and bore with alcohol</li> <li>5. To prevent recurrence, coat the shaft with a light film of Spinkote</li> </ol>

\*To be performed only by a qualified, trained service person



# Parts and Accessories List



Use only Beckman-approved parts and accessories for maximum reliability and to keep your warranty in effect.

Drive belt . . . . .	878513	Rubber pad for	
Drive motor brushes (2) . . . .	340536	100-mL tube holder . . . .	339271
Timer, 50-Hz . . . . .	339236	Stainless steel bucket† . . . .	340138
Timer, 60-Hz . . . . .	339229	Stainless steel buckets,	
Bowl gasket . . . . .	339228	matched set of four . . . .	340124
Spindle assembly . . . . .	340341	Solution 555 . . . . .	339555
Spindle boot . . . . .	339224	Rotor Cleaning Kit . . . . .	339558
Drive motor assembly*. . . . .	340342	Micro-Test Plate Carriers	
Maxi-Carrier tube racks . . . . .	see Table 1	(set of 4) . . . . .	342076
Fuse for 50-Hz instrument . . . .	865608	Spinkote lubricant . . . . .	306812
Fuse for 60-Hz instrument . . . .	881293	Silicone vacuum grease. . . .	335148
Holder assembly for			
100-mL tubes . . . . .	340125		

\* Because the motor is matched to the TJ-6 rotor, a replacement motor must be ordered from Beckman Instruments, or the warranty will be invalid. Dangerous overspeeding can result from using a mismatched motor.

† Indicate weight in grams of bucket to be matched.

# Warranty

---

Subject to the exceptions and upon the conditions specified below, Beckman agrees to correct, either by repair, or, at its election, by replacement, any defects of material or workmanship which develop within one (1) year after delivery of the Model TJ-6/TJ-6R Centrifuge (the product), to the original Buyer by Beckman or by an authorized representative, provided that investigation and factory inspection by Beckman discloses that such defect developed under normal and proper use.

Some components and accessories by their nature are not intended to and will not function for one (1) year. A complete list of such components or accessories is maintained at the factory and at each Beckman District Sales Office. The lists applicable to the products sold hereunder shall be deemed to be part of this warranty. If any such component or accessory fails to give reasonable service for a reasonable period of time, Beckman will repair or, at its election, replace such component or accessory. What constitutes either reasonable service and a reasonable period of time shall be determined solely by Beckman.

Any product claimed to be defective must, if requested by Beckman, be returned to the factory, transportation charges prepaid, and will be returned to Buyer with the transportation charges collect unless the product is found to be defective in which case Beckman will pay all transportation charges.

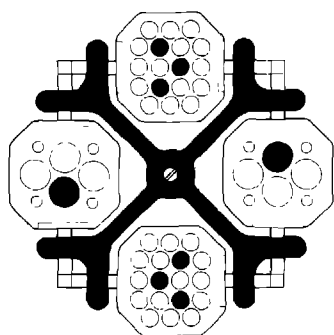
Beckman makes no warranty concerning products or accessories not manufactured by it. In the event of failure of any such product or accessory, Beckman will give reasonable assistance to the Buyer in obtaining from the respective manufacturer whatever adjustment is reasonable in light of the manufacturer's own warranty.

Subject to the exceptions and upon the conditions specified below, Beckman agrees to correct, either by repair, or, at its election, by replacement, any defects of material or workmanship which develop within seven (7) years after delivery of the TJ-6/R rotors (the product(s)), to the original Buyer by Beckman or by an authorized representative, provided that investigation and factory inspection by Beckman discloses that such defect developed under normal and proper use.

Beckman shall be released from all obligations under all warranties, either expressed or implied, if the product(s) covered hereby are repaired or modified by persons other than its own authorized service personnel, unless such repair by others is made with the written consent of Beckman, or unless such repair in the sole opinion of Beckman is minor, or unless such modification is merely the installation of a new Beckman plug-in component for such product(s).

IT IS EXPRESSLY AGREED THAT THE ABOVE WARRANTY SHALL BE IN LIEU OF ALL WARRANTIES OF FITNESS AND OF THE WARRANTY OF MERCHANTABILITY AND THAT BECKMAN SHALL HAVE NO LIABILITY FOR SPECIAL OR CONSEQUENTIAL DAMAGES OF ANY KIND WHATSOEVER ARISING OUT OF THE MANUFACTURE, USE, SALE, HANDLING, REPAIR, MAINTENANCE, OR REPLACEMENT OF THE PRODUCT.







# Safety Reminder

This page summarizes cautionary information basic to the safe operation of instruments. HOWEVER, it is strongly recommended that the user read the entire manual carefully before attempting to operate the instrument.

- Operator error or tube failure may generate aerosols. Toxic, pathogenic, or other hazardous materials must not be run in the TJ-6 centrifuge unless the instrument is operated in an appropriate biohazard safety enclosure and all appropriate safety precautions are taken.
- The centrifuge must not be used in the vicinity of flammable liquids or vapors, and such materials must not be run in the centrifuge.
- Do not lift or move the centrifuge when the drive motor and rotor are turning.
- Do not operate the centrifuge with the chamber bowl out of the instrument.
- Do not override the door lock until the rotor has stopped.
- Always disconnect the power cord before removing the bowl.
- Any maintenance procedure requiring removal of the bottom panel exposes the operator to the possibility of electrical shock and mechanical injury. For this reason, such service must be done only by trained and qualified service personnel. DISCONNECT THE POWER CORD BEFORE REMOVING THE BOTTOM PANEL.
- (Fifty-hertz instruments only) To avoid possible rotor overspeed problems, do not connect the instrument if the nominal power source is other than what is shown on the instrument rating plate on the rear panel. Do not rewire the instrument; call your Beckman Service Representative to make the proper modification.

## PRODUCT REGISTRATION

Please fill out and return this card within 14 days of first use of the product. It is a record of your purchase, and is on file for consumer protection.

# TJ-6 Tabletop Centrifuge

Product serial number \_\_\_\_\_ Date received \_\_\_\_\_  
Where is product located? Room: \_\_\_\_\_ Building: \_\_\_\_\_  
Address: \_\_\_\_\_  
Was the product received in good condition? YES NO (circle one)  
Missing parts, supplies, or literature: \_\_\_\_\_  
\_\_\_\_\_  
Installation problems: \_\_\_\_\_  
Product will be used for: \_\_\_\_\_  
\_\_\_\_\_  
Comments: \_\_\_\_\_  
\_\_\_\_\_  
Principal user: \_\_\_\_\_ Phone (\_\_\_\_) \_\_\_\_\_ ext. \_\_\_\_\_  
Dept., institution, address: \_\_\_\_\_  
\_\_\_\_\_  
Signed \_\_\_\_\_ Title \_\_\_\_\_ Date \_\_\_\_\_



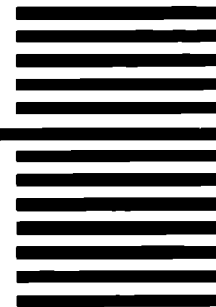
No Postage Stamp  
Necessary  
if Mailed in the  
United States

# Business Reply Mail

First Class Permit No. 247 Palo Alto, Ca.

Postage will be paid by addressee

Beckman Instruments, Inc.  
Spinco Division  
P. O. Box 10200  
Palo Alto, California 94304



## Precautionary Labels

The labels shown on this page are attached to your instrument. They are reproduced here as a reminder of the precautions to observe when installing and operating this equipment. Replacement labels will be provided free of charge if you write to Beckman Instruments Marketing Department, P. O. Box 10200, Palo Alto, CA 94304.

<b>CAUTION</b> DO NOT PERFORM ANY MAINTENANCE ON THIS EQUIPMENT WITHOUT FIRST DISCONNECTING FROM MAIN POWER SOURCE.	<b>ATTENTION!</b> N'EFFECTUER AUCUNE INTERVENTION DE MAINTENANCE SUR CETTE MACHINE SANS LA DECONNECTER DE LA SOURCE D'ALIMENTATION ELECTRIQUE.
<b>VORSICHT!</b> VOR INSTANDHALTUNGSARBEITEN, GERÄT VOM NETZ TRENNEN.	<b>¡ATENCIÓN!</b> NO REALIZAR NINGUNA OPERACION DE MANTENIMIENTO EN ESTE APARATO SIN DESCONECTARLE DE LA RED.
<small>270-340818-A</small>	<small>Printed in U.S.A.</small>

<b>CAUTION</b> This instrument is wired to operate on a voltage source as indicated on the Serial Number label on the rear panel. For operation on other voltages, the instrument must be rewired by a representative of Beckman Instruments, Inc.	<b>VORSICHT!</b> Die Betriebsspannung ist auf dem Typenschild auf der Rückseite des Gerätes ersichtlich. Falls nötig, kann das Gerät an andere Netzspannungen, durch einen Beckman Kundendienst Techniker, angepasst werden.
<b>ATTENTION!</b> Cet instrument doit être branché sur le voltage indiqué sur l'étiquette du numéro de série qui se trouve sur le panneau arrière. En cas d'utilisation sur d'autres voltages, cet instrument doit être reconnecté par un représentant de Beckman Instruments.	<b>¡ATENCIÓN!</b> Este instrumento está provisto de alambre para operar por medio de una fuente de voltaje como está indicado en la etiqueta del número de serie en el tablero posterior. Para funcionar de otros voltajes este instrumento debe ser realambreado por un representante de Beckman Instruments.
<small>270-340883</small>	<small>Printed in U.S.A.</small>

<b>WARNING</b> FOR CONTINUED PROTECTION AGAINST FIRE HAZARD, REPLACE ONLY WITH 7A, 125V T.D. FUSE.	<b>ACHTUNG!</b> FUER DAUERSCHUTZ GEGEN FEUERGEFAHR, NUR DURCH 7A, 125V TRAEGE SICHERUNG ERSETZEN.
<b>ATTENTION!</b> POUR UNE PROTECTION CONTINUELLE CONTRE LE FEU, REMPLACEZ UNIQUEMENT AVEC UN FUSIBLE RETARDE 7A, 125V.	<b>¡ATENCIÓN!</b> PARA CONTINUA PROTECCION CONTRO EL FUEGO, REMPLAZAR SOLAMENTE CON UN (1) FUSIBLE DE RETARDO 7A, 125V.
<small>270-340973</small>	<small>Printed in U.S.A.</small>